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Toward the Asphaltene Structure by Electron Paramagnetic Resonance Relaxation Studies at High Fields (3.4 T)

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Abstract

© 2016 American Chemical Society.A series of 12 asphaltene samples extracted from heavy oils and the oxidized bitumen of different origin has been studied with high-frequency W-band (94 GHz) pulsed electron paramagnetic resonance (EPR) spectroscopy. Transverse (T2e) and longitudinal (T1e) relaxation times of the free radical (FR) and the vanadyl porphyrin (VO^{2+}) were measured for each sample. A significant contribution of the spectral diffusion to T2e has been revealed and ascribed to the dipole-dipole interaction between the FR and VO^{2+}. This indicates that the distance between the FR and VO^{2+} does not exceed a few nanometers, which means, in turn, that VO^{2+} can participate in construction of the asphaltene aggregates via the intermolecular interactions.

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